

AMENDMENTS TO THE CLAIMS

Claims 1 – 21. (Canceled)

22. (Currently Amended) A liquid discharging method for discharging droplets from a plurality of liquid discharging portions onto a recording medium while controlling the discharging directions and angles of the droplets, the liquid discharging portions comprising a liquid chamber containing liquid to be discharged and a plurality of heating elements arranged in a predetermined direction inside the liquid chamber to generate a bubble in the liquid in the liquid chamber by the application of energy so that the liquid is discharged from a liquid discharging outlet, and the method comprising the steps of:

obtaining information about a defective liquid discharging portion by checking the discharging states of the droplets discharged from the liquid discharging portions; and

prohibiting the defective liquid discharging portion from discharging; and

discharging droplets from a liquid discharging portion different from the defective liquid discharging portion while controlling the discharging direction and angle by forming a bubble generation time difference by applying a difference in energy between at least one of the heating elements and at least another one of the heating elements so as to control the discharging direction and angle of the liquid discharged from the liquid discharging outlet based on the value of the bubble generation time difference.

23. (Currently Amended) A liquid discharging method for forming dot arrays or dots on a recording medium by discharging droplets from a plurality of liquid discharging portions while controlling the discharging direction and angle, and changing the dot diameter ~~by~~ based on the number of the discharged droplets, the liquid discharging portions comprising a liquid chamber

containing liquid to be discharged and a plurality of heating elements arranged in a predetermined direction inside the liquid chamber to generate a bubble in the liquid in the liquid chamber by the application of energy so that the liquid is discharged from a liquid discharging outlet, and the method comprising the steps of:

obtaining information about a defective liquid discharging portion by checking the discharging states of the droplets discharged from the liquid discharging portions; and

prohibiting the defective liquid discharging portion from discharging; and

discharging a plurality of droplets from a liquid discharging portion different, other than ~~from~~ the defective liquid discharging portion, while controlling the discharging direction and angle by forming a bubble generation time difference by applying a difference in energy between at least one of the heating elements and at least another one of the heating elements so as to control the discharging direction and angle of the liquid discharged from the liquid discharging outlet based on the value of the bubble generation time difference.

24. (Currently Amended) A liquid discharging method for forming dot arrays or dots on a recording medium by discharging droplets from a plurality of liquid discharging portions while controlling the discharging direction and angle, and changing the dot diameter ~~by~~ based on the number of the discharged droplets, the liquid discharging portions comprising a liquid chamber containing liquid to be discharged and a plurality of heating elements arranged in a predetermined direction inside the liquid chamber to generate a bubble in the liquid in the liquid chamber by the application of energy so that the liquid is discharged from a liquid discharging outlet, and the method comprising the steps of:

obtaining information about a defective liquid discharging portion having discharging failure by checking the discharging states of the droplets discharged from the liquid discharging portions;

prohibiting the defective liquid discharging portion from discharging and generating new droplet discharging signals for reducing the influence of the discharging failure of the defective liquid discharging portion; and

discharging droplets from a liquid discharging portion different from the defective liquid discharging portion while controlling the discharging direction and angle by forming a bubble generation time difference by applying a difference in energy between at least one of the heating elements and at least another one of the heating elements so as to control the discharging direction and angle of the liquid discharged from the liquid discharging outlet based on the value of the bubble generation time difference, according to the new droplet discharging signals.

25. (Previously presented) A liquid discharging method according to claim 24, wherein the new droplet discharging signals are generated only when the diameter of the dots formed on the recording medium by the droplets discharged from the liquid discharging portion different from the defective liquid discharging portion takes a minimum value or is close to the minimum value.

26. (Previously Presented) A liquid discharging method according to claim 24 or 25, wherein the new liquid discharging signals are generated on the basis of a previously created table.

27. (Previously Presented) A liquid discharging method according to any one of claims 22 to 24, wherein the discharging failure means that no droplets are discharged from the defective liquid discharging portion.

28. (Previously Presented) A liquid discharging method according to any one of claims 22 to 24, wherein the discharging failure means that the discharging direction from the defective liquid discharging direction deviates from an allowable range.

29. (Previously Presented) A liquid discharging method according to any one of claims 22 to 24, wherein the discharging failure means that the amount of liquid in the droplets discharged from the defective liquid discharging portion is outside an allowable range.

30. (Currently Amended) A liquid discharging apparatus for forming dot arrays or dots on a recording medium by discharging droplets from a plurality of liquid discharging portions onto the recording medium while controlling the discharging direction, the apparatus comprising:

a liquid discharging head having the liquid discharging portions, wherein each of the liquid discharging portions comprises a liquid chamber containing liquid to be discharged; and

a plurality of heating elements arranged in a predetermined direction inside the liquid chamber to generate a bubble in the liquid in the liquid chamber by the application of energy so that the liquid is discharged from a liquid discharging outlet;

a head driver for controlling the driving of the liquid discharging head;

a processing unit for that converts externally input signals into droplet discharging signals for driving the liquid discharging head and sends the droplet discharging signals to the head driver; and

a storage section for storing information about a defective liquid discharging portion having discharging failure, the information being obtained by checking the discharging states of the droplets from the liquid discharging portions;

wherein the influence of discharging failure of the defective droplet discharging portion is reduced by prohibiting the defective liquid discharging portion from discharging and discharging droplets from a liquid discharging portion different from the defective liquid discharging portion while controlling the discharging direction by forming a bubble generation time difference by applying a difference in energy between at least one of the heating elements and at least another one of the heating elements so as to control the discharging direction and angle of the liquid discharged from the liquid discharging outlet based on the value of the bubble generation time difference, according to the information about the defective liquid discharging portion stored in the storage section.

31. (Currently Amended) A liquid discharging apparatus for forming dot arrays or dots on a recording medium by discharging droplets from a plurality of liquid discharging portions onto the recording medium while controlling the discharging direction and angle, and changing the dot diameter by the number of the discharged droplets, the apparatus comprising:

a liquid discharging head having the liquid discharging portions, wherein each of the liquid discharging portions comprises a liquid chamber containing liquid to be discharged and

a plurality of heating elements arranged in a predetermined direction inside the liquid chamber to generate a bubble in the liquid in the liquid chamber by the application of energy so that the liquid is discharged from a liquid discharging outlet;

a head driver for controlling the driving of the liquid discharging head;

a processing unit that converts externally input signals into droplet discharging signals for driving the liquid discharging head and sends the droplet discharging signals to the head driver; and

a storage section for storing information about a defective liquid discharging portion, the information being obtained by checking the discharging states of the droplets discharged from the liquid discharging portions,

wherein the influence of discharging failure of the defective droplet discharging portion is reduced by prohibiting the defective liquid discharging portion from discharging and discharging droplets from a liquid discharging portion different from the defective liquid discharging portion while controlling the discharging direction by forming a bubble generation time difference by applying a difference in energy between at least one of the heating elements and at least another one of the heating elements so as to control the discharging direction and angle of the liquid discharged from the liquid discharging outlet based on the value of the bubble generation time difference, and to change the dot diameter, according to the information about the defective liquid discharging portion stored in the storage section.

32. (Currently Amended) A liquid discharging apparatus for forming dot arrays or dots on a recording medium by discharging droplets from a plurality of liquid discharging portions onto the recording medium while controlling the discharging direction and angle, and changing the dot diameter by the number of the discharged droplets, the apparatus comprising:

a liquid discharging head having the liquid discharging portions, wherein each of the liquid discharging portions comprises a liquid chamber containing liquid to be discharged and

a plurality of heating elements arranged in a predetermined direction inside the liquid chamber to generate a bubble in the liquid in the liquid chamber by the application of energy so that the liquid is discharged from a liquid discharging outlet;

a head driver for controlling the driving of the liquid discharging head;

a processing unit that converts externally input signals into droplet discharging signals for driving the liquid discharging head and sends the droplet discharging signals to the head driver;

a storage section for storing information about a defective liquid discharging portion, the information being obtained by checking the discharging states of the droplets discharged from the liquid discharging portions; and

a discharging corrector for generating new droplet discharging signals to reduce the influence of discharging failure of the defective discharging portion,

wherein the influence of discharging failure of the defective droplet discharging portion is reduced by prohibiting the defective liquid discharging portion from discharging according to the information about the defective liquid discharging portion, and discharging droplets from a liquid discharging portion different from the defective liquid discharging portion while controlling the discharging direction and angle by forming a bubble generation time difference by applying a difference in energy between at least one of the heating elements and at least another one of the heating elements so as to control the discharging direction and angle of the liquid discharged from the liquid discharging outlet based on the value of the bubble generation time difference, according to the new droplet discharging signals generated by the discharging corrector so as to change the dot diameter.

33. (Previously presented) A liquid discharging apparatus according to claim 32, wherein the new droplet discharging signals are generated only when the diameter of the dots formed on the recording medium by the droplets discharged from the liquid discharging portion different from the defective liquid discharging portion takes a minimum value or is close to the minimum value.

34. (Previously Presented) A liquid discharging method according to claim 32 or 33, wherein the new liquid discharging signals are generated on the basis of a previously created table.

35. (Previously Presented) A liquid discharging apparatus according to any one of claims 30 to 32, wherein the storage section is provided inside the liquid discharging head, inside the processing unit, or inside an external control unit.

36. (Previously Presented) A liquid discharging method according to any one of claims 30 to 32, wherein the discharging failure means that no droplets are discharged from the defective liquid discharging portion.

37. (Previously Presented) A liquid discharging method according to any one of claims 30 to 32, wherein the discharging failure means that the discharging direction from the defective liquid discharging direction deviates from allowable range.

38. (Previously Presented) A liquid discharging method according to any one of claims 30 to 32, wherein the discharging failure means that the amount of liquid in the droplets discharged from the defective liquid discharging portion is outside an allowable range.

39. (Canceled)

40. (Previously Presented) A liquid discharging apparatus according to any one of claims 30 to 32, wherein each of the liquid discharging portions comprises:
a liquid chamber containing liquid to be discharged; and

a plurality of energy-generating elements arranged in a predetermined direction inside the liquid chamber to generate energy for causing the liquid in the liquid chamber to be discharged from a liquid discharging opening,

wherein a difference in energy to be generated is formed between at least one of the energy-generating elements and at least another one of the energy-generating elements so as to control the discharging direction of the liquid discharged from the liquid discharging opening.

41. (Canceled)

42. (Canceled)

43. (Previously Presented) A liquid discharging method according to any one of claims 22 to 24, wherein the liquid chamber comprises a pair of heating elements which simultaneously generate energy for causing the liquid in the liquid chamber to be discharged from the liquid discharging outlet.

44. (Previously Presented) A liquid discharging method according to any one of claims 30 to 32, wherein the liquid chamber comprises a pair of heating elements which simultaneously generate energy for causing the liquid in the liquid chamber to be discharged from the liquid discharging outlet.

45. (New) A liquid discharging method according to claim 22, wherein the discharging direction and degree of the angle of the liquid discharged from the liquid discharging outlet is controlled by adjusting the bubble generation time difference.

46. (New) A liquid discharging method according to claim 30, wherein the discharging direction and degree of the angle of the liquid discharged from the liquid discharging outlet is controlled by adjusting the bubble generation time difference.